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Examiner Name	K. A. Bareford
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ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
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Attorney Docket No. 121657-3/11944 (21635-0090-D1)
Application No.: 10/758,381

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	TEFFT et al.	)	
Application No.:	10/758,381	)	Group Art Unit: 1762
Filed:	January 15, 2004	)	Examiner: Katherine A. BAREFORD

For: HIGH-TEMPERATURE POWDER DEPOSITION METHOD UTILIZING FEEDBACK CONTROL (As Amended)

Mailstop APPEAL BRIEF - PATENTS
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APPLICANT'S REPLY UNDER 37 C.F.R. §41.41

Sir:

Applicant files this Reply Brief under 37 C.F.R. §41.41 in response to the Examiner's Answer mailed October 28, 2005.

Applicant and the Examiner are in agreement on points 1-8 on pages 1-3 of the Examiner's Answer and no reply is needed.

(9, 10). Grounds of Rejection and Response to Argument.

Ground 1. Claims 12-17 and 19-24 are rejected under 35 USC 103 over Moore U.S. Pub. 2003/0161946 in view of Knight Article.

The present approach differs from those of Moore and Knight in two fundamental ways: (1) the control system approach, i.e., the relation of what is measured and what is controlled in the deposition process, and (2) the parameters that are measured to form the basis of the process control.

(1) As to the first fundamental difference, independent claims 12 and 19 recite:

"measuring a flow rate of the fuel to the deposition gun, a flow rate of the oxidizer to the deposition gun, a flow rate of the powder to the deposition gun, and a cooling capacity of the coolant flow; and

set-point controlling the flow rate of the fuel, the flow rate of the oxidizer, the flow rate of the powder, and the cooling capacity of the coolant flow, all responsive to the step of measuring."

(quote from claim 12--claim 19 is substantially the same)

These claims recite that four listed parameters are measured, and then those same four parameters are set-point controlled "all responsive to the step of measuring."

The Moore reference teaches in para. [0028] that certain sensors are provided to monitor some deposition parameters: a camera, a voltmeter or electrical probes, ultrasonic or magnetic emitters and/or detectors, a thermometer, and coating thickness monitors. Moore then teaches in para. [0034] that the output information of these sensors may be provided to a controller, which then adjusts the operating parameters of the deposition apparatus. The operating parameters are the flow rate of gases and powder to the spray gun, and the flow rates of coolant fluid through the cooling system, see para. [0033] of Moore. Importantly, these parameters being controlled by Moore are not the same parameters that are measured by Moore. This stands in stark contrast to Applicant's claimed invention which recites that the parameters being measured are the same parameters being responsively controlled.

Knight has an approach different from both that of Moore and the present claims. Knight does not control any parameters at all during any one deposition process, either responsive to measurements of those parameters or any other parameters. Knight selects some fixed values for parameters, sets those parameters to the fixed values, and then runs the deposition process with those parameters fixed. See p. 160, second column, first paragraph after Table I. Knight simply has a matrix of test parameter values and runs some tests with all of the parameters fixed for each test.

The approaches of Moore and Knight are different from each other and are incompatible with each other. The approaches of Moore and Knight are also different from

the presently claimed approach, because the presently claimed approach measures four parameters and responsively set point controls those same four parameters.

(2) As to the second fundamental difference, the process parameters that are measured and serve as the basis for control, as understood by Applicant, the thrust of the Examiner's argument is that Moore has an "open ended teaching" (Examiner's Answer, page 12, line 2) into which any imaginable measurable parameters may be inserted. Knight does not teach controlling the process on the parameters recited in the present claims, but mentions some parameters of the deposition process (Examiner's Answer, page 12, lines 7-12).

The Examiner's argument is based on an attempt to give each reference a teaching and meaning that it clearly does not have.

Moore's teaching is not, in fact, "open ended" and does not suggest using any measured parameters other than the specific ones stated in Moore. The Examiner's analysis of Moore is based on para. [0028] and [0034] of Moore (Examiner's Answer, page 11, lines 15-19). However, in making this analysis, the Examiner presents incomplete, truncated quotes from these paragraphs in an attempt to make them say something that they do not.

The entirety of para. [0034] of Moore states:

> "[0034] Controller 15 may monitor the coating process using the sensors, as preciously [*sic*] discussed, and either provide feedback to an operator who makes adjustments or automatically adjust [*sic*] the operation to stay within selected coating parameters in response to variations in temperature, fluctuations in coating process parameters, the rate of coating deposition or any other detectable variations in the coating process."

Para. [0034] does not set forth an "open ended" teaching that allows any conceivable parameter to serve as the basis for feedback control. Para. [0034] restricts its control to parameters obtained from "the sensors, as previously discussed", and any conclusions that may be reached using those sensors. The Examiner's attempt to broaden the teaching of Moore to all "fluctuations in coating process parameters" and "any other detectable variations in the coating process" is incongruent with a reading of para. [0034] in

its entirety, which clearly states that its teaching is limited to monitoring the coating process using "the sensors, as previously discussed."

The "previously discussed" sensors of para. [0034] are discussed in para. [0028]. The complete paragraph states:

> "[0028]. In some embodiments of the present invention, sensors may be included in the extension arm, allowing the interior surface 30, and any coating thereon, to be inspected. Sensors may include a camera 54, which may be a video camera allowing a portion of the applied coating to be examined. Alternatively, camera 54 may be configured for ultraviolet or other wavelength reception or transmission, in conjunction with an emitter in that or another wavelength. Additional sensors may include a voltmeter 56, or electrical probes, for determining the electrical resistance or the current carry capacity of a coating by grounding the conduit exterior and measuring current flow across the coating. Other sensors could include ultrasonic or magnetic emitters and/or detectors allowing the distance between the spray gun 14 or extension arm 12 and the interior surface 30 of pipe 11 to be monitored, a thermometer for measuring the temperature of the interior diameter of the pipe 11, and coating thickness monitors for measuring the thickness of the coating 31."

Thus, "the sensors, as previously discussed" referred to in para. [0034] of Moore are limited to a camera, a voltmeter or electrical probes, ultrasonic or magnetic emitters and/or detectors, a thermometer, and coating thickness monitors.

The Examiner's argument on this subject is based on incomplete quotes of sentences from para. [0028]. At page 11, lines 16-18, short quotes from para. [0028] of Moore are presented as follows: "For example, the paragraph states 'Additional sensor may include...' or 'Other sensors could include...'". Thus, the Examiner attempts to overcome the actual teachings of Moore by substituting ellipses for specifically identified types of sensors which make it clear that "the sensors, as previously discussed," are of a limited group and that there is no "open ended teaching":

"Additional sensors may include a voltmeter 56, or electrical probes, for determining the electrical resistance or the current carry capacity of a coating by grounding the conduit exterior and measuring current flow across the coating." [emphasis added, to highlight the Examiner's incomplete quote of the sentence]

"Other sensors could include ultrasonic or magnetic emitters and/or detectors allowing the distance between the spray gun 14 or extension arm 12 and the interior surface 30 of pipe 11 to be monitored, a thermometer for measuring the temperature of the interior diameter of the pipe 11, and coating thickness monitors for measuring the thickness of the coating 31." [emphasis added, to highlight the Examiner's incomplete quote of the sentence]

None of the sensors mentioned in these complete sentences can measure "a flow rate of the fuel to the deposition gun, a flow rate of the oxidizer to the deposition gun, a flow rate of the powder to the deposition gun, and a cooling capacity of the coolant flow" as recited in the two independent claims now under appeal, claims 12 and 19.

Moore has very definite teachings about what may be monitored and used to control the process. The only sensors that can be used in Moore's process are those disclosed in para. [0028], none of which can monitor or measure the recited parameters of the appealed claims.

The Knight Article contains the following statement at p. 159, second full paragraph of right-hand column:

> "Variables include fuel type; fuel and oxygen ratio, pressure and total flow, which determine the temperature, velocity and oxygen potential of the flame; nozzle length and diameter, which determine particle velocity and residence time; powder size distribution and feed rate; and gun/part surface speed. Since both water and air cooled HVOF guns have been developed the flow rate and temperature of the cooling media also affects the flame temperature and characteristics of the coating produced."

There is no teaching of monitoring and set point controlling, responsive to the step of monitoring "a flow rate of the fuel to the deposition gun, a flow rate of the oxidizer to the

deposition gun, a flow rate of the powder to the deposition gun, and a cooling capacity of the coolant flow" as recited in the present claims. "Fuel and oxygen ratio" as discussed by Knight is a very different parameter than a separately measured "flow rate of fuel" and "flow rate of oxidizer", separate variables that are absolute flow rates, not ratios. The parameters listed in this excerpt from Knight are described as "variables", not parameters to serve as the basis for set point controlling.

To further emphasize this point and explain what Knight means by "variables", Knight teaches an experimental approach described in the first paragraph after Table 1 in the second column of page 160:

> "A series of tests was carried out varying each of three key spray parameters--surface speed of the part, spray distance and fuel:oxygen ratio--in turn by +/- 10% and +1- 20% from the baseline condition, requiring 13 experiments in total. Total gas flow (O_2 + C_3H_6) was kept constant at 536 l/min (1135 SCFH) and all other parameters were fixed at the baseline values."

The person of ordinary skill in the art learns from this paragraph that Knight does not measure and control any parameters "responsive to the step of measuring" as recited in the present claims. Knight selects values from his list of "variables" and sets those values as constants for the duration of the test. There is no monitoring and feedback control of these "variables". And even if there were monitoring and feedback control, the "variables" being taught are not the parameters recited in the present claims.

To summarize, Moore teaches that his process operating parameters may be controlled using information obtained by measurements from a specific set of sensors: a camera, a voltmeter or electrical probes, ultrasonic or magnetic emitters and/or detectors, a thermometer, and coating thickness monitors. Knight teaches a number of "variables", i.e., quantities that can be changed, but further teaches that these "variables" are to be kept fixed during the course of any one deposition operation.

The approaches of Moore and Knight are incompatible with each other and differ from the present approach for three major reasons.

First, Moore teaches that certain parameters are to be monitored, but that these parameters are not controlled during the course of the test--some other parameters specific to the deposition source are the quantities that are actually controlled. Knight teaches that some different "variables" are set to fixed values during the course of the deposition operation, but they are not monitored or used to control the process. The two approaches operate in different ways, which are themselves different from the present approach. The present claims recite that four named parameters are measured, and these same four parameters are responsively set-point controlled.

Second, regarding the parameters that are the subjects of the two references and of the present claims, what is truly striking about the two references is that they seem to be talking about entirely different processes, or entirely different perceptions of the same process. Not a single one of the parameters taught to be measured by Moore is even mentioned by Knight, and not a single one of the "variables" taught by Knight is mentioned by Moore as a parameter to be measured. There is no overlap at all in the concepts taught by the two references. And, in any event, neither of the references teaches the parameters recited by the present claims to be measured and controlled.

Third, MPEP 2143.01 provides that, in constructing a sec. 103 rejection, the proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference. MPEP 2143.02 requires that, in combining the teachings of two references, there must be a reasonable expectation of success in the combination. Both of these mandates would be violated in the proposed approach of combining modifying the teachings of Moore with those of Knight. The Examiner's proposal is to replace the parameters taught by Moore to be monitored with those taught by Knight to be kept fixed and constant during the course of a run. This would render Moore's process inoperable, because Knight uses completely different variables and because Knight requires that these variables be kept constant during the course of any one deposition run while Moore teaches that some parameters are controlled.

Applicant now turns to the discussion of specific claims in the Examiner's Answer.

Claims 12 and 19

The Examiner's Answer relies on the arguments discussed above, and Applicant incorporates its prior discussion.

In the discussion, the Examiner's Answer seeks to discount the experimental comparisons performed by Applicant and reported in para. [0029] of the Specification. See page 16, lines 9-14 of the Examiner's Answer.

Applicant conducted and reported experiments comparing the claimed approach with the closest realistic alternatives, the commonly used, prior art D-gun approach and the present process but without feedback control. See para. [0029] of the Specification and the associated discussion in Applicant's Appeal Brief. At page 16, lines 9-14, the Examiner's Answer declines to discuss this experimental evidence on its merits, but instead suggests that an experimental comparison with "Moore in view of Knight Article" would be the proper comparison. No such experimental comparison can possibly be conducted. "Moore in view of Knight Article" is a hypothetical construct used to define a rejection under the patent laws, not a real process in the physical world, nor could any such real process be created.

Applicant is not aware what it would mean to try to define a process that is "Moore in view of Knight Article" as argued by the Examiner. Would such a process change parameters during the course of a deposition as in Moore, or would the parameters be kept fixed as in Knight? Would the process of Moore be modified so that the parameters of Knight were used, or would some of the parameters of Moore be used and some of the parameters of Knight be used? Would the parameters of Moore be used, but kept constant during any one deposition run, as required by Knight? Furthermore, neither reference teaches measuring four recited parameters and responsively set-point controlling those same four parameters.

Applicant compared its approach with the industry standard, the D-gun approach as described in para. [0005] of the Background section of the present application, the closest actual prior art, not a hypothetical process having no definite meaning. Applicant also compared the present closed-loop set point controlled approach with that of a similar physical structure but without the closed-loop control. The present process performed better than those approaches.

Claims 13 and 20

Neither reference teaches "measuring a coolant temperature of the coolant flow" and responsively set point controlling the coolant flow, as recited in these dependent claims.

The Examiner appears to concede that Moore has no such teaching, but relies instead on Knight. See Examiner's Answer, page 5, lines 7-10. The reliance is on Knight, but Knight never teaches measuring the temperature of the coolant flow and using it as a control parameter in set point controlling the coolant flow. The Examiner's argument is that this parameter "would be suggested to be monitored for fluctuations or variations" (Examiner's Answer, page 17, lines 14-15). This is merely conjecture, and in any event, the value in Knight is set as a constant, not responsively set point controlled. Knight teaches that its variables are set at fixed values for the duration of any one coating run. Significantly, coolant temperature was not even addressed in the experiments that were performed by Knight, see Table I and its discussion on page 160 of Knight.

Claims 14 and 21

Dependent claims 14 and 21 recite "measuring a coolant flow rate of the coolant flow" as a parameter that is responsively set-point controlled according to the respective parent claims.

The Examiner's Answer fails to effectively identify a single location in either reference that discloses or teaches that a coolant flow rate is measured. At the bottom of page 4 of the Examiner's Answer, para. [0034] of Moore is cited as the source for this teaching, but a reading of para. [0034] shows that there is absolutely no mention of "measuring a coolant flow rate of the coolant flow." The only sensors used by Moore to conduct actual measurements are those disclosed in para. [0028] and discussed at length above, which include a camera, a voltmeter or electrical probes, ultrasonic or magnetic emitters and/or detectors, a thermometer, and coating thickness monitors. None of these sensors measures a coolant flow rate.

Claims 15 and 22

These dependent claims recite a specific structure for the deposition gun recited in the respective parent claims.

The Explanation of the Rejections at pages 3-7 of the Examiner's Answer does not even mention these claims, except for a single parenthetical reference to claim 15 at line 9 of page 5, although the claims are addressed in at pages 19-20 of the Response to Arguments section of the Answer.

The thrust of the Examiner's argument appears to be that Knight teaches that "all current HVOF designs operate on similar principles..." Claims 15 and 22 do not speak of "principles", they recite physical structure. At page 20, line 10, the Examiner's Answer asserts that Knight teaches the following physical structure: "mixer, deposition flow director and cooling structure". Knight has no such teaching of this structure as recited in claims 15 and 22. Knight is a 1992 article, so the reference to "all current HVOF designs" has no particular relevance to the design illustrated in the present application, filed 12 years later in 2004, unless each of the recited claim limitations can be shown to be taught by Moore or Knight. But that is not the case.

Claims 16 and 23

These dependent claims recite providing specific instrumentation for measuring flow rate of the fuel, flow rate of the oxidizer, flow rate of the powders, and cooling capacity of the coolant. The explanation of the rejection at page 5, lines 1-2 of the Examiner's Answer references para. [0034] of Moore as the source for such a teaching. Para. [0034] of Moore, reproduced hereinabove, clearly has no such teaching. Moore's teaching is limited to the sensors disclosed in para. [0028] of Moore: a camera, a voltmeter or electrical probes, ultrasonic or magnetic emitters and/or detectors, a thermometer, and coating thickness monitors. Knight does not teach instrumentation for measuring these four parameters, and neither Knight nor Moore teaches replacing the sensors of Moore with those of Knight.

Claims 17 and 24

Each of claims 17 and 24 recites in part:

> "a controllable fuel source of the fuel communicating with the combustion chamber, wherein the controllable fuel source is automatically controlled responsive to the fuel measurement,
>
> a controllable oxidizer source of the oxidizer communicating with the combustion chamber, wherein the controllable oxidizer source is automatically controlled responsive to the oxidizer measurement,
>
> a controllable powder source of the powder flow communicating with the mixer, wherein the controllable powder source is automatically controlled responsive to the powder measurement, and
>
> a controllable coolant source of a flow of the coolant that provides an inlet flow of coolant to the cooling structure, wherein the controllable coolant source is automatically controlled responsive to the coolant measurement." [emphasis added]

The basis for the rejection is said to be para. [0034] of Moore. See page 5, lines 3-4 of the Examiner's Answer. Para. [0034] of Moore has no teaching of measuring fuel and responsively controlling the fuel source, measuring oxidizer and responsively controlling the oxidizer source, measuring powder flow and responsively controlling the powder flow, and measuring coolant and responsively controlling the coolant flow.

As demonstrated above, Moore measures one set of parameters and controls a different set of parameters. To find a teaching for the present approach, one would have to completely throw out the control approach taught by Moore and replace it with a control approach found only in the present application.

Knight does not provide any assistance in the construction of the rejection. Knight requires that all of the parameters be kept constant during any one deposition process, see page 160 of Knight, second column, first paragraph after Table I.

The combining of the teachings of Moore and Knight

Moore teaches a control approach in which one set of parameters dealing with the deposit are measured, and another set of parameters dealing with process control are controlled. Knight teaches that all process parameters are maintained constant during any one deposition operation. The approaches of Moore and Knight are incompatible.

The approach set out at pages 25-27 of the Examiner's Answer is once again to rely on shortened quotes that misrepresent what Moore is teaching. See page 26, lines 12-15 of the Examiner's Answer. Moore does not teach an "open-ended" approach as argued. Moore teaches a definite approach in which measurements are made using a camera, a voltmeter or electrical probes, ultrasonic or magnetic emitters and/or detectors, a thermometer, and coating thickness monitors (Moore, para. [0028]). Then somehow, in a fashion that is not specified in Moore, decisions are made how to control a completely different set of process parameters such as flow rate of gases and powder to the spray gun and flow rates of coolant fluid (Moore para. [0033]).

Knight teaches that its process parameters are maintained constant during any one deposition process.

These two approaches are not compatible. If the Moore approach were modified to incorporate the Knight teachings, as proposed in the statement of the rejection, Moore's approach would become inoperable and it would not be expected to succeed.

In short, there is no basis for combining the teachings of these references.

As discussed in the Appeal Brief, the law of the combining of references does not permit the teachings of one reference to be altered in a way not contemplated by the reference, and then combined with the teachings of another reference, where the combination would be contrary to the teachings of both references and would render the process inoperable.

Ground 2. Claims 18 and 25 are rejected under 35 USC 103 over Moore in view of Knight Article, and further in view of Nakagawa U.S. Patent 5,958,522.

This rejection of dependent claims 18 and 25 is based upon the combination of the Moore and Knight references, which does not teach the basic approach of the respective parent claims for the reasons stated earlier and which are incorporated here.

The Appeal Brief has discussed the non-analogous character of the Nakagawa technology. Nakagawa's deposition apparatus is not of the type recited in the respective parent claims, in which "a deposition gun burns a mixture of a fuel and an oxidizer to form a deposition gas flow, mixes a powder into the deposition gas flow to form a deposition mixture flow, and projects the deposition mixture flow therefrom, wherein the deposition gun is provided with a flowing coolant" (quote from claim 12). Figure 1 of Nakagawa and the discussion at col. 3, lines 32-63 of Nakagawa make it clear that Nakagawa's device does not operate in this recited manner. Further, Nakagawa does not apparently use any coolant as required by the parent claim.

The Examiner fails to respond to the differences in the recited structure found in the present claims and that of the references, particularly Nakagawa. The Examiner's Answer instead bases its analysis on non-relevant features that are not recited in the claims: speed of the combustion gas, flame temperature, and, incredibly, the fact that there are "shock diamonds" present (as there are in rocket engines and high-speed aircraft engines as well). The references to these irrelevancies directs attention away from the fact that Nakagawa's spray device does not have the structure or function recited in the present claims and in the devices of Moore and Knight.

In the sentence at the bottom of page 29 and then continuing on to page 30 of the Examiner's Answer, there is an attempt to conclude that "Nakagawa is in the field of appellant's endeavor." It is not. Applicant's field of endeavor is a "a deposition gun that burns a mixture of a fuel and an oxidizer to form a deposition gas flow, mixes a powder into the deposition gas flow to form a deposition mixture flow, and projects the deposition mixture flow therefrom, wherein the deposition gun is provided with a flowing coolant" (quote from claim 12). Applicant's field of endeavor is not deposition apparatus generally.

This quoted language has never been amended; Applicant did not try to claim a broader field of endeavor at an earlier stage, and then narrow the claims in response to prior art. Applicant has always addressed the same field of endeavor, as recited in claims 12 and 19.

The Examiner's Answer seeks to broaden the scope of the field of endeavor to sweep in other art, such as Nakagawa. The attempt to broaden the field of endeavor is based on non-recited features such as speed of the combustion gas, flame temperature, and the fact that there are "shock diamonds" present. The claims recite, and have always recited, specific structure that is demonstrably different from that of Nakagawa.

Nakagawa is a reference plucked from the vast body of patent literature because it uses a similar fuel:oxygen ratio to that recited in claims 18 and 25, in a completely different deposition context. No person of ordinary skill would be inclined to borrow concepts from Nakagawa for the technology as recited in the present claims.

Thus, there is no basis for combining the teachings of Nakagawa with those of Moore and Knight, in view of the completely different deposition technologies.

SUMMARY AND CONCLUSION

The combination of references applied to reject the present claims does not teach either the control approach recited in the present claims or the relevant process parameters that are measured.

As to the control approach, the present claims recite a process control approach in which a group of four parameters (a flow rate of the fuel to the deposition gun, a flow rate of the oxidizer to the deposition gun, a flow rate of the powder to the deposition gun, and a cooling capacity of the coolant flow, see claims 12 and 19) are measured, and then those same four parameters are set-point controlled. In Moore, a group of specific sensors (a camera, a voltmeter or electrical probes, ultrasonic or magnetic emitters and/or detectors, a thermometer, and coating thickness monitors, see Moore para. [0028]) are used to make measurements, and a completely different set of parameters are controlled (flow rate of gases and powder to the spray gun, flow rates of coolant fluid, see Moore para. [0033]). In Knight, the process parameters are fixed for any selected process run (Knight, p. 160, second column, first paragraph following Table I).

As to the process parameters that are measured, the present rejections are based upon the Examiner's position that Moore's teaching is "open ended", i.e., that it can encompass anything. As demonstrated here and in the Appeal Brief, Moore's teaching is limited to measurements attained with a specific group of sensors listed in para. [0028] of Moore: a camera, a voltmeter or electrical probes, ultrasonic or magnetic emitters and/or detectors, a thermometer, and coating thickness monitors. None of these sensors measure the parameters recited in claims 12 and 19: a flow rate of the fuel to the deposition gun, a flow rate of the oxidizer to the deposition gun, a flow rate of the powder to the deposition gun, and a cooling capacity of the coolant flow.

Applicant asks that the Board reverse the rejections.

Respectfully submitted,

McNees Wallace & Nurick LLC

Dated: December 6, 2005

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